

Report to The Cal/EPA Environmental Justice Advisory Committee on the Review of Midway Village Site Remediation

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Site History and Purpose of Review

Overview of Site: Midway Village is a federally funded (Section VIII) public housing facility in Daly City (located in San Mateo County in the Southern San Francisco Bay Area) that was constructed on a site that had previous industrial use. Of primary concern is the site's original use as a manufactured gas plant (MGP) in the early twentieth century. Subsequently, the site was under the control of a municipal power generating company (PG&E). The Federal Public Housing Authority, acquired the site through eminent domain and constructed military housing on it. During construction of the housing, contaminated soil from the MGP area of the site was used as fill on which the housing was built. In the mid-1950s, the site was acquired by County of San Mateo; the military housing was demolished in the 1970s, additional grading and soil movement was done, and Midway Village and the Bayshore childcare center and park were built in its place. In 1979, the portion of the site where the MGP operated was returned to PG&E, which now operates it as a maintenance facility.

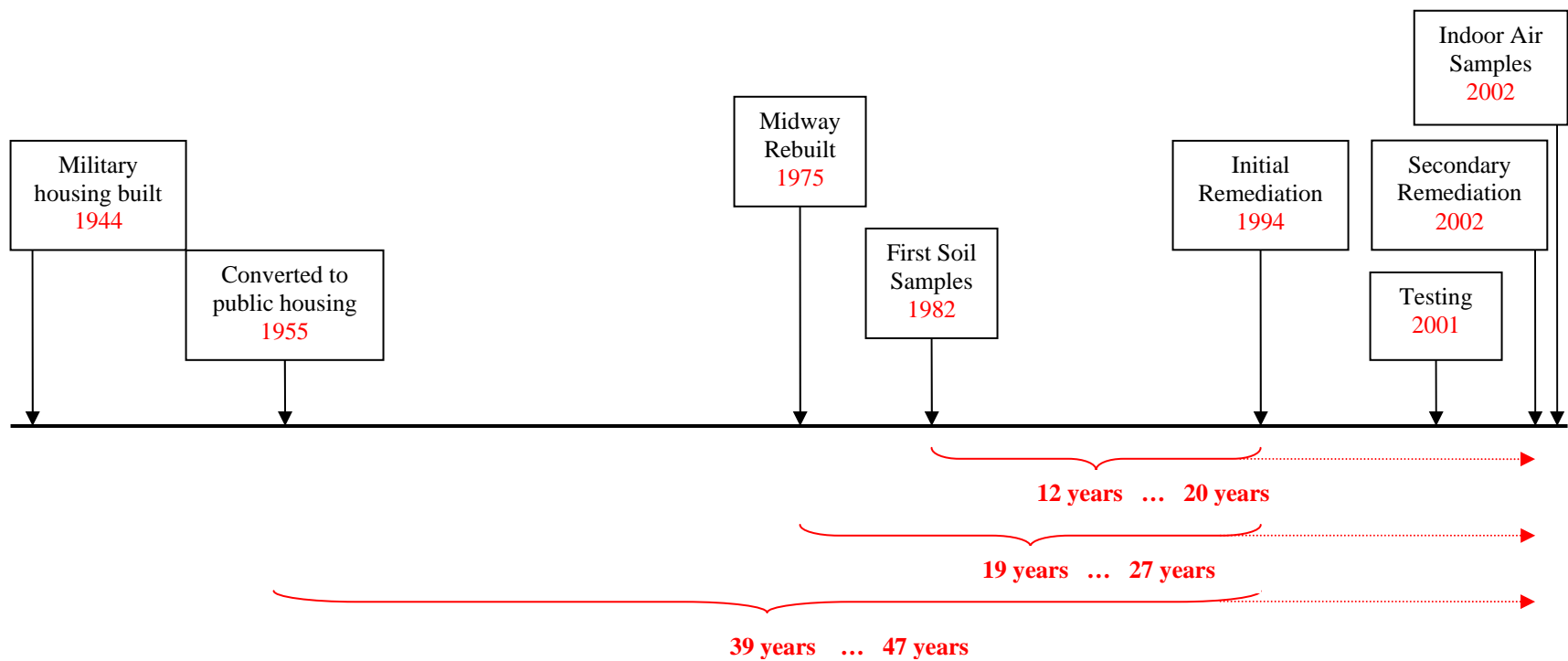
1982 – 1993: Site Testing and Identification: The first record of soil testing done at the MGP site is in 1982, by PG&E. It should be noted that the residents of Midway Village provided material for this review; they indicate records of the condemnation proceedings in the 1940s identify the presence of polynuclear aromatics, or PNAs, in the soil at the site. The records themselves were not provided, however, so this was not independently verified. Subsequent tests were done by PG&E in 1985 and 1987; all results were provided to the Department of Toxic Substance Control (DTSC) and the Regional Water Board. DTSC conducted its own sampling at Midway in 1989. In 1990, San Mateo County excavated soil that looked contaminated, and DTSC began their formal investigation of the site. Soil samples were taken in 1990, and samples in 1992 and 1993 included air and groundwater as well. In addition to polyaromatic hydrocarbons (PAHs, another name for PNAs), the groundwater sampling found cyanide, benzene, ammonia, phenols, and petroleum hydrocarbons. The residents of Midway state that hexavalent chromium has also been found in the soil, although it is unclear which testing found it or in what concentrations. In 1990, DTSC had concrete patios installed over the yards in the units on the northern edge of the housing complex, to prevent direct contact with the soil.

1994: Initial Remediation: The initial remediation plan was executed in 1994 and called for removal of impacted soil to a clean-up level of 10 mg per kg of PAHs. The soil was removed to a depth of 2 feet and replaced with 2 feet of clean fill. Soil underneath parking areas, houses, concrete walkways, and patios was not removed. No confirmation testing was done at that time.

1998: Construction and Remediation at Bayshore Park: As part of a drainage project in 1998 at Bayshore Park, adjacent to Midway Village, the City of Daly City prepared a Removal Action Workplan (RAW) for the Park. Following the remediation plan for Midway village, the RAW set a clean-up level of 10 mg/kg for surface soils, and capping of subsurface soils with 2 feet of clean fill in conjunction with institutional controls restricting further disturbance of soils.

2000 – 2001: Supplemental Testing: DTSC had the housing site tested in 2000, and then again in 2001. These tests showed concentrations of PAHs in shallow soils (depth < 6 inches) up to 16 mg/kg, expressed as equivalents to benzo(a)pyrene. At a depth of 2 feet, B(a)Peq were 28 mg/kg, and at 4.5 feet depth, the maximum found was 92.4 mg/kg. The tests also indicated the presence of cyanide, lead, and phenolic compounds. Significantly, the report notes the presence of hydrocarbons in many of the samples, present in sufficient quantity to cause “strong matrix interference problems.”

2002: Second Remediation: DTSC implemented a second remediation with a clean-up target of 0.9 mg/kg PAHs.



Purpose of Review: In September, 2005, after hearing testimony from residents of Midway Village at several Committee meetings, the California Environmental Protection Agency (Cal/EPA) Environmental Justice Advisory Committee (CEJAC) recommended that the Secretary of Cal/EPA initiate a review of the remediation actions at the Midway Village housing site. In response to that recommendation the Secretary and the Inter-Agency Working Group (IWG) at Cal/EPA requested that the Office of Environmental Health Hazard Assessment (OEHHA), which is part of Cal/EPA, undertake a review of the Midway cleanup. The IWG invited three members of the CEJAC to participate in the review with OEHHA staff, and funded a technical expert chosen by members of the Midway Village community. A staff member from the Department of Toxic Substance Control (DTSC) also participated, representing the agency that oversaw the remediation of the site.

Charge to the Office of Environmental Health Hazard Assessment: The IWG gave a very specific assignment to OEHHA, and the Office structured its review within the parameters of the assignment. Specifically, the Office was charged with reviewing available documents to determine if the scientific process was adequate to protect the health of the residents of Midway Village.

CEJAC Questions: In 2005, the Committee received presentations on Midway Village from DTSC staff and from a group of residents. Committee members held a robust discussion of the site, its remediation, and the ongoing concerns of the residents. Although the Committee members' concerns covered a fairly broad area, there are certain questions about Midway that are specifically germane to the Committee's charge under statute. The CEJAC is charged with assisting the Secretary of Cal/EPA and the IWG with identifying environmental justice gaps in the programs carried out under Cal/EPA. In light of that charge, there are three basic questions that need to be asked about the clean-up at Midway – not only as an isolated situation, but representative of the site remediation program. The questions are:

1. What was the “standard of care” at the time the site was identified, and was it met?
2. Has the “standard of care” changed, and have the changes been addressed at Midway?
3. Is the “standard of care” adequate now to support environmental justice?

This report to the Committee attempts to answer these three core questions. Considerable amounts of information were reviewed in the process of the review, however the data is (and may always be) incomplete. In addition to the materials provided by OEHHA staff, the CEJAC members participating in the review considered current local guidelines and practices, remediation guidelines and actions in other states, reports of remediation projects both inside and outside of California, technical remediation bulletins and newsletters from the remediation sector, and the report prepared by Wilma Subra, the technical consultant to the residents of Midway Village. The CEJAC members also met with Midway residents, visited the site, reviewed health data from residents, and consulted with academic, environmental, and medical experts.

Some additional information is certainly available if greater time and resources can be devoted to the review, including materials that were entered as evidence in legal proceedings surrounding the Midway site and may be available through the courts, and guidelines, reports, and case studies done throughout the United States and internationally, that are referenced but not readily available in the public domain. Other information, such as specific uses of the industrial site between 1915 and 1944, and the chemical content of soils that were removed from the site at various times without sampling, or with only limited sampling, may never be known.

This report uses the data available and relies on several key tenets of the CEJAC, as expressed in the Committee's Recommendations to the Cal/EPA IWG, September 30, 2003:

- Recommendations to collect and consolidate data should not result in lengthy delays in implementation of reasonable, feasible, strategies to reduce known and significant impacts. [Recommendations Report, pg. 16)
- Where environmental justice impacts have already been documented, or environmental justice concerns are clearly understood to exist, discussions about criteria should not prevent agencies from using available data and tools, and taking action to respond to those concerns. [Recommendations Report, pg. 20]
- It is not necessary or appropriate to wait for actual, measurable harm to public health or the environment before evaluating alternatives that can prevent or minimize harm. [Recommendations Report, pg. 13]

Finally, this review is not meant to single out DTSC or its staff, or to imply that they did not carry out the tasks required of them as the staff understood those tasks and considering the resources allocated for the work. Rather, the review is undertaken as a case study because concerns have been raised by an environmental justice community that warrant further review. Also, there appears to be a significant disconnect between the perspectives of the community members and the agency staff. Hopefully, the review will help both parties to reach a better mutual understanding of the situation at Midway Village, and move them closer to resolving some of the problems. Equally important, however, is to use this review to help identify and address broader programmatic gaps that may prevent this Department (or the others of the Boards, Departments, and Office, a.k.a. "BDOs") from achieving Cal/EPA's objective of environmental justice for all Californians.

Question 1: *What was the "standard of care" at the time the Midway Village site was identified, and was that standard met?*

As a matter of context it is important to note that the federal Superfund program was established in 1980, in response to the declared State of Emergency due to pollution in Love Canal. Prior to that time, there was much less awareness of these kinds of problems and a less systematic approach to identifying and addressing them. The initial testing done by PG&E was in 1982, before there were established practices for pursuing these cases, and before the common understanding of the issues surrounding MPG sites had emerged. As the chronology of events progressed, however, a national consensus among environmental regulators did develop and continues to evolve; that evolution informs the discussion of Questions 2 and 3, later in this report.

It is also important to note that the land that once housed the manufactured gas plant was subsequently divided and is now three separate parcels. For the purpose of this discussion, the term "Midway site" is used loosely to include the parcel that is now Midway Village, the parcel that is now Bayshore Park, and the parcel that is now the PG&E Martin Service Center.

Site identification- The earliest reports of soil sampling associated with the Midway site was in 1982. It was conducted by PG&E on the utility's property, and the results of the sampling were provided to DTSC and the RWQCB [ref. ERRG Report, Aug. 22, 2003, provided as Appendix A to the OEHHHA report]. The results of that sampling were not disclosed as part of the OEHHHA review, however it is reasonable to assume they showed contamination because PG&E subsequently undertook remediation at the site.

The contamination at the PG&E Martin Service Center does not constitute evidence that the Midway Village housing site was contaminated, but it does indicate that contamination was a possibility, and would warrant further investigation. It is not clear that the Department then had any established guidelines regarding the timelines for investigating areas adjacent to contaminated industrial sites. Notwithstanding, seven years passed before DTSC initiated its own testing of the site (showing slightly elevated levels of PAHs in yards along the northern edge of the complex), and no action was taken at that time. Action was taken when a San Mateo County construction crew uncovered visibly contaminated soil during a drainage project; DTSC began its formal review of the site, including more extensive testing, and, as a precaution, installed patios over the yards where the worst contamination was found.

Without knowing the results of the samples taken by PG&E during the 1980s, or the Department's guidelines for investigating adjacent sites, it is difficult to say precisely what the standard of care was at that time for identifying sites, or if it was met. Notwithstanding, eight years seems like a long time to initiate formal site testing. Once the Department had evidence of the contamination, however, they commenced remediation plans and implemented them in accordance with accepted timelines at the time. Notwithstanding, 12 years passed from the time first PG&E tests until the initial remediation occurred in 1994.

Site characterization- Tests conducted for DTSC between 1990 and 1992 showed soil and water contamination that included PAHs, benzene and other petroleum constituents, arsenic, cyanide, phenols, and ammonia. There is significant variability in the test results across the geographic site, due in large part to the fact that contaminated soil from the MGP operation was used as fill and spread over areas that may not have otherwise been contaminated. It is also reasonably possible that there were additional sources of contamination that may have their own geographic distribution patterns, and while this was not pursued previously, it should not be neglected now (see discussion under Question 2). Known and potential sources of contamination are discussed below.

- *Manufactured Gas Plants.* Widespread concern about contamination at former MGP sites was just beginning in the 1990s. Based on the early site use, DTSC staff focused quickly on the contaminants expected from MGP operations. The Remedial Investigation (RI) included 70 surface samples (6 inches or less in depth, and wherever possible in the top 2 inches of soil), and 80 subsurface samples in 20 different locations (at approximate depths of 2 ft, 5ft, 7.5 ft, and 10 ft in each of 20 boreholes) including 3 deep samples (between 20 and 25 feet deep). All samples were analyzed for PAHs. Surface samples were also analyzed for phenols and cyanides, which were found to be present below remediation targets. Subsurface samples were also analyzed for phenols, cyanides, and volatile organic compounds (VOCs). One subsurface sample was also analyzed for total petroleum hydrocarbons, metals then listed under Title 22, ammonia, sulfides, and pH. There were 19 background surface soil samples taken from a mix of non-residential and off-residential properties which were analyzed for PAHs, phenols, and cyanides.

Sampling results showed the soil at the site is composed of “silts, sands, and clay, as well as construction debris such as brick, metal, wood, glass, and concrete.” [Ref. DTSC Final RAP for Midway Village, August 23, 1993]

- *PAHs*: Sampling detected PAHs in 69 of 70 onsite surface samples, with a high of 176 mg/kg, and 46 of 80 subsurface samples with a high of 626 mg/kg. Offsite samples had PAHs in 17 of 19 cases, but the highest concentration was only 1 mg/kg. Of the subsurface samples analyzed, 15 showed contamination greater than 10 mg/kg and all of these were in fill. Samples were also taken at Bayshore Park and showed contamination above 10 mg/kg in 11 samples.
- *Phenols*: Sampling showed phenols in 37 of 70 surface samples with a high concentration of 31 mg/kg. They were present in 3 of the background samples at less than 1 mg/kg. Samples with phenols were widely distributed onsite, and the distribution did *not* match the distribution of PAHs. The RAP did not discuss results of phenols in subsurface samples.
- *Cyanides*: Sampling showed cyanides in 19 of 70 surface samples, with a high concentration of 41 mg/kg. It was not detected in background samples and the RAP did not discuss cyanides in subsurface samples. Cyanides were generally found in the northern half of the site, but their distribution was *different* from the distribution of both PAHs and phenols.
- *Other pollutants tested*: The RAP did not provide results for other pollutants tested, although references have been made elsewhere to the presence of ammonia and arsenic.

The RAP also summarized the results of groundwater sampling. It indicates that 3 sample wells were drilled, with one well (W-1) influenced by irrigation (higher water table, and fresher, less salted water with a “substantially” different concentration from the other two wells). The RAP gives a general direction of water movement from east to west but states that more precise determination was difficult. PAHs were detected in W-1 (the diluted well), and W-2, with the high concentration of 33.5 ug/L in W-2. Cyanide, benzene, and total petroleum as diesel were also detected in both wells, except that benzene was not detected in the diluted well, W-1.

The RAP does not discuss the observed differences in the sampling wells. Examination of a site diagram shows that wells W-1 and W-2 are located along the northern edge of the site in adjacent storm-drain basins, whereas W-3, the well that showed no contamination, is near the southern edge of the area identified as having PAHs in the soil. By today’s standards, three sampling wells, with one being diluted from irrigation, seems like a fairly small sample pool, however, given that the chief concern at the time was focused on groundwater used for drinking, and this groundwater is brackish and therefore not potable, this sample size may be consistent with the standard of care at that time.

In summary, it was not unreasonable that MGP residues were the primary focus of the DTSC investigation, and the characterization of key MGP pollutants seems to meet the contemporaneous standard of care. Unfortunately, the RAP does not provide the results for a number of pollutants tested (although the presence of ammonia, arsenic, and other metals has been mentioned elsewhere without details provided), so no conclusion is drawn about those. There are, however, additional contaminants that result from MGP operations that should have been identified and characterized, particularly in response to the observed groundwater contamination that included other compounds.

Table 1: Summary of Contaminants & Location				
Contaminants	Surface	Subsurface	Groundwater	Air
PAHs	176 mg/kg	626 mg/kg	33.5 ug/L	<i>not available</i>
Phenols	31 mg/kg	<i>not available</i>	<i>not available</i>	<i>not tested</i>
Cyanides	41 mg/kg	<i>not available</i>	140 ug/L	<i>not tested</i>
Total petroleum	<i>not tested</i>	<i>not available</i>	130 ug/L	<i>not tested</i>
BTEX	<i>not tested</i>	<i>not available</i>	2.1 ug/L	<i>not tested</i>
Ammonia	<i>not tested</i>	<i>not available</i>	<i>not tested</i>	<i>not tested</i>
Arsenic	<i>not tested</i>	<i>not available</i>	<i>not tested</i>	<i>not tested</i>
Metals	<i>not tested</i>	<i>not available</i>	<i>not tested</i>	<i>not tested</i>
Sulfides	<i>not tested</i>	<i>not available</i>	<i>not tested</i>	<i>not tested</i>

- *Petroleum products.* The MGP produced lighting gas from petroleum. Although it is understood today that the wastes from this process do not generally contain volatile organic compounds (VOCs) other than naphthalene, this was less well understood at the time. In addition, the storage and use of crude petroleum onsite creates a real and non-negligible potential for spills and leaks, common causes of contamination, and groundwater testing showed the presence of petroleum hydrocarbons.

In addition, the portion of the site that is presently under PG&E control is used as a power distribution substation and utility service yard. It is under permit with the Bay Area Air Quality Management District (BAAQMD) to store and dispense fuel. Similar activities may have occurred at the site prior to the construction of housing; the site was under utility control from 1915 until the mid 1940s but there are no records of its use because that period predates requirements for permits and records.

For many years, fuel dispensing was unregulated and spills and leaks were common. As stated, samples taken in 1992 showed the presence of hydrocarbons (listed “as diesel”) in the groundwater. Petroleum was not included as a “chemical of concern” however, in the DTSC remediation plan, because the groundwater, being brackish, was not suitable for drinking. While that may be a reasonable judgment in and of itself, it neglects the possibility of other routes of exposure to petroleum hydrocarbons, particularly when the soil is disturbed. As the OEHHA report points out, petroleum contaminants can migrate upward over time, especially when rains raise the water table level. For this reason, petroleum constituents should have been identified as COPCs for the project.

- *PCBs.* Wilma Subra, the technical consultant representing residents of Midway, pointed out that many MGP sites also have PCBs contaminating the soil because old lighting transformers were made with PCBs, and these were frequently disposed of onsite. Given the size of the original parcel, and that it is landfilled wetlands, onsite disposal of old transformers is not unreasonable in this case. Although the mandate to remove the old transformers from service did not occur until after PG&E surrendered control of the site to the federal government, routine service would have required some ongoing replacement and disposal, as well as storage of parts for future use. Because there is a reasonable question as to whether PCBs are present, testing should be done that either characterizes or rules out contamination by PCBs.

- *Other sources of contamination.* Other activities have occurred at the site during the last century, separate from the operation of the MGP plant, that could create further contamination and exposure to the residents of Midway Village. In addition to fuel storage and dispensing should, and potential contamination from PCBs, there are other less obvious potential sources of contamination. These may not have been considered as potential exposure scenarios even if more information had been available at the time. However, reviewing the site today we would also identify as possible contamination sources: solvent based cleaning operations, waste incineration, and potential onsite waste disposal. These are discussed in the context of Question 2, below.

Finally, no information has been presented that would either include or rule out contamination from other *offsite* activities that were either historical or more contemporary to the current use (i.e., fuel storage and distribution at a nearby site). This may, in fact, have already been considered and ruled out. If it has not, it should be evaluated.

Air sampling. Although several reports mention air samples taken in the early 1990s, very little specific information is available about where or how many samples were taken; the Remedial Action Plan (RAP) states that samples were downwind of the areas with high PAH concentration, and samples of total suspended particulates (TSPs) and particles less than 10 um in size (PM10) were collected. The RAP further states that onsite concentrations of PAHs were the same as offsite samples. No mention is made of sampling for VOCs. If the project had included remediation of petroleum hydrocarbons, the air quality permit would have required periodic testing of the outlet concentration from the abatement device(s), which would have documented air exposure for some constituents during the remediation phase. Based on the information available, it is not possible to conclude whether the contemporaneous standard of care was met.

Site remediation- In their review of the Midway Village clean-up, OEHHA focused on the second clean-up effort and did not review the adequacy of the first. DTSC identified PAHs, cyanide, and phenols as “chemicals of potential concern” or “COPC” for the first remediation. The initial remediation target for PAHs was 10 mg/kg. Because it was subsequently revised we can conclude that by today’s standards it was not sufficiently protective, but DTSC indicated it was based on standards in place under other federal programs in the late 1980s and early 1990s. At face value, then, 10 mg/kg PAHs seems to have been one accepted standard of care.

The issue becomes less clear when a comparison is made between two similar remediation actions overseen by DTSC that were roughly contemporary. A summary of remediation actions at the Alhambra MGP plant site in southern California (plan circa 1996, which was two to three years later than the plan at Midway) indicates a substantially different approach. The Alhambra site is a neighborhood of single family residences constructed on soil contaminated with PAHs from the prior operation of an MGP facility. In this instance the target was 0.9 mg/kg, all plantings and hardscape (walkways, patios, etc.) were removed, the soil was remediated to an average depth of 4-5 ft, and then plantings and hardscape were replaced. Soil was also removed from the crawlspaces beneath homes, but not beneath foundations nor close enough to damage them. In Midway, only exposed soil was remediated; patios and walkways were left in place, and soil was not removed beneath the homes. There is no explanation of the differences in approach (see also Table 2). [Ref. U.S. EPA, A Resource for MGP Site Characterization and Remediation: Expedited Site Characterization and Source Remediation at

Former Manufactured Gas Plant Sites, May 1999; also Cal/EPA News Release for DTSC, dated February 28, 1998: Former Alhambra Gas Plant Site Cleanup is Completed]

There is no mention of air monitoring during the remediation activities at Midway to ensure that the project did not result in exposure to the residents, and there was no enclosure of the remediation activities. Although that is a common consideration at these types of projects now, it is not clear whether it was an established practice for MGP remediation in 1994. However, the BAAQMD does now, and did then, require an air quality permit from the District for soil remediation activities where petroleum hydrocarbons are present, because petroleum constituents do volatilize and present a potential cancer and non-cancer threat to public health that should be evaluated. The District has no record of a permit application for remediation at Midway either from DTSC or from the contractors carrying out the work. This is probably because DTSC did not include petroleum hydrocarbons at COPCs for the project, but, as stated, the identification, characterization, possibly remediation, and monitoring should have occurred.

Public participation- There appears to be substantial disagreement between the residents of Midway Village and the Department about what degree of notice and involvement was afforded the residents. Chief among the complaints from the residents is that they were not notified of the presence of contamination until 1990, and that they were told by the Director of the Department that it was safe to eat vegetables grown in their gardens if the vegetables were washed first, and for children to play in the soil provided that they bathed frequently. The Department states that signs were posted, residents were warned and offered temporary relocation, and that this met their standard for participation. If the success of public participation is measured by the ongoing dialogue, cooperation, and respect between the community and the agency, then we would have to find this effort unsuccessful. In light of the recommendations from OEHHHA for additional testing, and the recommendations for further action contained in this report, a concerted effort should be made to involve the residents early in these next efforts. This should include their review of the testing plans prior to execution of the testing itself.

Public health assessment- DTSC did not conduct any public health evaluation of the residents at Midway as part of the original remediation effort. This does not appear to be unusual in terms of the standard of care at the time the site was identified. Residents report a variety of health problems, including nosebleeds, skin rashes, respiratory ailments, and cancers. It is not clear now whether there was sufficient evidence of health complaints at the time the site was originally identified to suggest that a systematic evaluation should be undertaken. Subsequent analyses done at the initiation of the residents suggest that follow-up work here is needed; this is discussed in greater detail under Question 2, below.

Question 2: *Has the “standard of care” changed since the site was identified, and have the changes been addressed at Midway?*

Site characterization- Based on current knowledge and standards, there are several areas that might not have been considered as potential sources for contamination in the late 80’s and early 90’s, but given current knowledge should be assessed. In addition, current knowledge strengthens the case for a more rigorous characterization of petroleum contamination even though considerable time has elapsed since the presence of petroleum products was first detected.

- *Petroleum Hydrocarbons.* The OEHHA review of the 2002 remediation concludes that testing for petroleum hydrocarbons in the soil should have been done, and should be done now. This the case for several reasons, in addition to those previously discussed.

DTSC does not believe that further testing is necessary. First, DTSC states soil samples did not show the presence of VOCs. Second they indicate that there was and is no reason to expect petroleum hydrocarbons or other VOCs to be present. Third, they believe that even if there had been VOCs in the soil, they would have evaporated by now.

- *Testing results-* DTSC staff have stated that soil tests did not show the presence of petroleum or VOCs. Based on the information provided, it appears that samples taken in 2001 that were analyzed for the presence of VOCs were taken from excavated soil that had been stockpiled and not covered for some period of time. Under such circumstances, VOCs that were present would likely have evaporated. On the other hand, soil samples taken prior to excavation and analyzed for PAHs was reported as having “strong matrix interference due to the presence of hydrocarbons in many of the samples.” Recall that petroleum was found in two out of three groundwater wells, and benzene in one of those wells (but not in the one diluted by irrigation water); taken together, this indicates a presence of hydrocarbons rather than none.
- *Basis for suspecting petroleum/VOCs in the soil-* DTSC staff explain that examination of the many MGP sites remediated over that last fifteen or so years shows that MGP operations that used petroleum as a feedstock (as opposed to coal) produced wastes that did not contain volatile organic compounds. As stated previously, however, petroleum storage and use onsite provided ample opportunity for contamination as a result of MGP operations.

In addition, it is possible that the petroleum products present in the soil and, particularly, the groundwater, did not originate from the operation of the MGP plant. That could explain why samples along the northern edge of the Midway housing project (adjacent to the MGP site, and where the highest PAH concentrations have been found) in 1989 showed no petroleum hydrocarbons, whereas subsequent testing of soil and water showed contamination. Hydrocarbon contamination could have occurred from fuel, as discussed previously, or solvent leakage or spills (see below) in other areas of the industrial site. During the grading a filling process that preceded construction of housing, these soils could reasonably have been moved to different parts of the Midway site; as has been shown with the distribution of phenols and cyanides, the distribution of petroleum and/or other VOCs could follow a different pattern. Groundwater movement can also redistribute the contaminants, especially over long time periods.

- DTSC has stated that there is no reason to conclude that VOCs are now present in any significant concentration, because the excavation should have allowed them to evaporate. VOCs that are present as part of heavier contamination, such as petroleum crude or diesel fuel, can actually be retained in the bulk layer for considerable time and released when events (such as heavy rains that affect the water table) cause disruption that allows them to escape. As mentioned above, soil testing in 2001 showed “strong matrix interference” from hydrocarbons

present in the soil. In addition, residents report a “nailpolish” like smell in certain areas on warm days following rains. This is typical of subsurface contamination: the rains raise the groundwater level, pushing the more buoyant hydrocarbons to the surface, where surface heat causes increased evaporation.

In summary, there is more than a reasonable suspicion of the presence of hydrocarbons in the soil and groundwater, there is evidence they are present. The nature and extent of the contamination has never been fully characterized, and no remediation done that would prevent ongoing exposure. Testing of soil and groundwater is necessary, and remediation for hydrocarbons still present should be undertaken unless the testing conclusively shows they have dissipated to such a degree that ongoing exposure is not possible.

- *PCBs and metals.* Testing conducted in 2002 by U.S. EPA found PCBs in one out of five samples taken. Samples also found lead and arsenic, but below general clean-up target levels.
- *Solvent cleaning operations.* Previously, PG&E maintained permits for solvent cleaning tanks at their service yard. The permits were surrendered, and there is no current record of the solvents used. Typical cleaning solvents in the last several decades include trichloroethane (TCA), trichloroethylene (TCE), methylene chloride, and perchlorethylene. All of these are toxic, some significantly so. Requirements for proper disposal of solvents came about in the last twenty to twenty-five years, and it is possible that solvents were disposed of, spilled, or leaked into the groundwater.
- *Waste incineration.* Several of the early documents provided by OEHHA note that waste incineration may have occurred on the site at some previous time (either as part of industrial activities or perhaps household wastes were incinerated at the complex before waste removal was provided. If this is, in fact, the case, onsite disposal of waste ash would have been typical until the last quarter of the 20th century and contamination with incineration residues should be considered. Compounds of concern would include metals, dioxins, and furans.
- *Other wastes.* As the OEHHA report states, there is very little data about the site between 1915 and 1944, other than it was the property of PG&E. OEHHA staff noted at one public meeting that because it was originally a wetland site that was filled in, it may be the repository of many different kinds of waste. Landfilled wastes in the presence of moisture degrade to form organic liquids and vapors, especially methane gas. In warm weather following rains, the bacteria that degrade the waste are more active and odors are more likely to appear – this could also be a source of the odors reported by the residents, but would have a very different constituent signature than petroleum contamination. While the presence and nature of possible landfilled wastes can’t be readily determined now, the possibility of the presence should inform groundwater testing based on a more current standard of care model.
- *Established literature.* In 1996, the Gas Research Institute published a comprehensive list of contaminants in soil, sediment, and groundwater at MGP sites that are of public health concern. The list includes six inorganic, non-metallic compounds (including

ammonia, cyanide, and sulfur compounds), sixteen metals (including arsenic, chromium, and lead), five volatile organic compounds (BTEX and styrene), three phenols, and eighteen PAHs. It is not clear from the data provided whether the site investigation included screening for all of these compounds; if it did not, then the site should be screened for the missed compounds.

- *Air sampling.* In 2002, indoor air samples were taken at five residences, all of which were uninhabited at the time, and in the Housing Office, and analyzed for the presence of PAHs. Furnaces were run during the 24-hr sampling, which increases the air flow into the residences. Napthalene was the only carcinogenic PAH found in concentrations exceeding 1 ng/m³. The highest detected concentration was in the Housing Office, at 151 ng/m³, and outdoor air at the site sampled at 23 ng/m³.

Indoor sampling should be conducted again both with and without dilution. Inhabited units should be sampled in addition to vacant units. Outdoor samples should be taken onsite, and offsite for control purposes. The sampling should also be analyzed for petroleum constituents. In addition, efforts should be undertaken in conjunction with the BAAQMD to attempt to verify residents' complaints of "nailpolish smells" on warm days following rains (or whenever the residents report the odors). The air district has an odor complaint line and established procedures for investigating odors, including, if appropriate, analyzing air samples taken at the site of the odor. In order for this to be successful, the odors must be reported immediately upon detection, to allow the area inspector time to respond.

Site remediation- The target was revised from 10 mg/kg to 0.9 mg/kg PAH in the soil and a second round of remediation was undertaken in 2002. This is a significantly more protective standard. However, the second remediation effort, occurring four years after the Alhambra effort, did not include the same degree of safety, as shown in the table below. Much discussion and debate can surround the question of whether a given numerical target is "adequate" but the fact remains that, adequate or not, the same degree of remediation was not undertaken in two similar sites, even though the same target was ultimately used, as shown in Table 2, below. This indicates that either a uniform standard of care does not exist, or a change in the standard of care did occur, and that the change has not been addressed at Midway.

Table 2: Comparison of Midway Village and Alhambra MGP Remediations			
	Midway 1994	Alhambra 1996	Midway 2002
PAH cleanup target	10 ug/kg	0.9 mg/kg	0.9 mg/kg
Exposed soil	removed 2 ft	removed avg. 5 ft	removed 2-5 ft
Soil beneath parking	left/covered	removed avg. 5 ft	left/covered
Soil beneath patios	left/covered	removed avg. 5 ft	left/covered
Soil beneath walkways	left/covered	removed avg. 5 ft	left/covered
Soil beneath sidewalks	left/covered	removed avg. 5 ft	left/covered
Soil beneath residences	left/covered	removed avg. 5 ft	left/covered
Community type	public housing	single family homes	public housing
Community satisfaction	very unhappy	pleased, celebrated	very unhappy

Community health analysis- DTSC states that a clinic was established in the late 1990s for the residents of Midway Village, at UCSF, but that no residents availed themselves of it. The residents say they were not notified of its existence, but when they did later find out and pursued it, they found that it was not a clinic at UCSF, but rather a private clinic run by the two physicians they say served as witnesses against the community and for PG&E in ongoing litigation, and they declined to work with them. It is not now possible to determine whether a clinic did exist, but it is clear that no data from such a clinic exists.

The community has initiated a registry of their own, without assistance or guidance from public health professionals. OEHHA, as part of their review, recently inquired of the federal Agency for Toxic Substance and Disease Registry whether they might perform such an evaluation, but ATSDR did not feel it was likely to yield useful results. There are, however, several analyses that, at a minimum, warrant follow-up actions.

- *Chromosome analysis.* In 1998, some residents of Midway voluntarily had genetic sampling done and submitted the analysis to ATSDR. The analysis looked at sister chromatid exchange (SCE), and chromosomal aberrations (CA) in adults and children. The SCE analysis showed 28 of 34 adults evidenced normal or below normal exchanges, and all (24 of 24) children evidenced normal levels. However, the CA analysis showed 19 of 24 adults had abnormal aberrations, and 32 of 34 children were found to be abnormal. ATSDR noted that no information was provided about what constituted “normal” or “abnormal” said there was insufficient data about the sampling. They further stated that they knew of no useful biomarkers for assessing exposure to PAHs.

While there may be insufficient data to determine if this specific test of chromosomal aberrations indicated anything significant, it certainly raises the question why there have been no further efforts to determine if significant health effects are being observed in the community at Midway. At a minimum, there should be some follow-up with the researcher who conducted the testing. If this is not now possible, retesting seems reasonable. As it stands, there is at least some indication that 79% of adults tested and 94% children tested had an unusual frequency of chromosomal aberrations in the opinion of at least one investigator (Dr. Jesus Nemenzo).

- *Community health analysis.* As part of the litigation brought by the residents of Midway Village, Dr. Rosemarie Bowler conducted an evaluation of the health effects seen in the residents at the site. Dr. Bowler is faculty member at San Francisco State University. She has participated in and chaired national panels on the effects on communities of environmental exposure to toxic compounds, including panel reviews under the umbrella of ATSDR. The community was compared with a socio-economically matched control community in the East Bay of the San Francisco Bay Area. The evaluation showed statistically significant physiologic and psychologic health effects among the residents of Midway. Her analysis was not published; it was entered as evidence in the lawsuit. DTSC was provided with copies of all evidence in the litigation.

This review does not purport to confirm or question the conclusions of Dr. Bowler’s study. However, the existence of a study by a credible researcher that points to

statistically significant health effects does raise the level of concern about the present health of the residents, and the effects of any potential ongoing exposure. It is a matter of concern that, without any data to show that the study is in error, the conclusion of DTSC and OEHHA remains that health of the residents has been adequately protected.

Environmental Justice Recommendations- Since the identification of the Midway site, and the completion of both remediation efforts there, environmental justice has become a more prominent issue in California. In October of 2003, the Interagency Working Group at Cal/EPA accepted recommendations from the Cal/EPA Advisory Committee on Environmental Justice (CEJAC) regarding approaches to evaluating and improving the programs at Cal/EPA and its Boards, Departments, and Office to achieve environmental justice goals. These recommendations have not been used by Cal/EPA to guide their current review of remediation and public health at Midway Village. They should inform future efforts, and this is discussed more under Question 3, below.

Comparison to other site remediation projects- One measure of the protectiveness of established standards, and the current “standard of care” is to look at the standards set by other jurisdictions. The following are offered for comparison purposes, and while they do not show the current DTSC standard to be inadequate, they do show that greater precaution is currently being practiced by other jurisdictions.

- *Missouri Department of Natural Resources.* The MDNR has established an industrial clean-up standard for benzo(a)pyrene of **0.6 mg/kg**. [Ref. Missouri Department of Natural Resources, Cleanup Levels for Missouri (CALM) Document, September, 2001]. A consultation with ATSDR indicated that a highly contaminated site in Moberly used a containment tent over the remediation project to prevent the possibility of exposure of nearby, offsite residents during remediation activities. [Ref. ATSDR Health Consultation: Moberly Former Manufactured Gas Plant, Moberly, Randolph County, Missouri, 2004].
- *Delaware Department of Natural Resources and Environmental Control.* The DDNREC has established a remediation standard of **0.8 mg/kg** for benzo(a)pyrene, in areas where the future use of the site is restricted. This standard is a Delaware Non-Critical Water Resource Area Restricted Use URS value. As outlined in the Final Plan of Remedial Action for an MGP site in Wilmington Delaware, the remediation includes soil removal and capping with pavement, installation of a subsurface containment wall with passive pumps for non-aqueous liquid phase contamination, phytoremediation upgradient of the containment wall, installation of at least three offsite groundwater monitoring wells, and deeded restriction of the future uses of the property in perpetuity to **prohibit any current or future residential use** of the property. [Ref. Delaware Department of Natural Resources and Environmental Control Final Plan of Remedial Action for the Wilmington Coal Gas Site – North Parcel/OU-01, in Wilmington, Delaware, September, 2004]
- *Illinois Environmental Protection Agency.* Under the IEPA’s Voluntary Site Remediation Program (SRP), Commonwealth Edison (CE) undertook a remediation of the soil in a recreational park in the Village of Oak Park, Cook County, Illinois. The Park was installed on the site of a former MGP, and contaminated soils were

graded prior to planting. Under the agreement between IEPA, CE, the Village, and the Park District, soil was removed from Barrie Park and under its adjacent streets. The Illinois Department of Public Health, in April 1999 concluded that there were no statistically significant cancer clusters in Oak Park between 1986 and 1996. ATSDR and IDPH, in September 1999, concluded that exposure to surface soil in the park did not pose a public health hazard. In February, 2000, ATSDR and IDPH concluded that there was no public health risk from exposure to surface soil in adjacent residential yards, the Barrie Center, or the “Tot Lot”. Notwithstanding, under the voluntary agreement, Edison was required to remove park soils to a depth of 10 feet, and to a depth of 18 feet where future uses might include construction. Further, in areas of known wastes (termed “source material”) the utility was required remove soils to depth of at least 28 feet (in some cases up to 40 feet), and to any depth needed to meet the remediation target under the streets. During the clean-up, the most contaminated areas were tented, and all soil removal was done in the presence of perimeter air monitoring for BTEX and naphthalene. IEPA established Project Ambient Air Quality Standards (PAAQS) for the pollutants of concern, based on an exposure model for a 33 pound child at the fenceline 24 hours a day during the 18 month excavation. The Park was closed to the public during remediation, and a Citizens Advisory Committee was formed to oversee the remediation. [Ref: Oak Park Information Sheet, Frequently Asked Questions and Answers About the Barrie Park Remediation Project, June 2003; ATSDR Health Consultation: Review of Air Data At and Near the Barrie Park Former Manufactured Gas Plant Site at South Lombard and Garfield Avenues, Oak Park, Cook County, Illinois, undated]

- *Bay Area Air Quality Management District.* In 2005, the BAAQMD released a draft engineering review of a permit for the air pollution mitigation during the remediation of a former MGP site in Saint Helena, California. This remediation effort followed after several prior efforts, and included a dual phase soil vapor extraction system with three phases of abatement: thermal oxidation, catalytic oxidation, and carbon adsorption, with a total destruction efficiency of 98.5%. The site is within 1000 feet of a school and public notice was done to the parents of students at that facility, and three other schools within one quarter mile of the site, and to all addresses within a 1000 foot radius of the site. A phone line was set up at the District to respond to questions about the remediation activity. The permit calls for verification testing of the pollution control equipment upon startup, and includes requirements to monitor the performance of the pollution control equipment monthly and a change-out schedule for the carbon adsorption units.

Table 3: Comparison of Cleanup Actions in Different Jurisdictions

Location	PAH target	Residential Use	Air mitigation / monitoring	Community Advisory Committee
Midway, CA	0.9 mg/kg	yes	no	none indicated
St. Helena, CA	0.9 mg/kg	yes	abatement/ yes	no
Wilmington, DE	0.8 mg/kg	no, prohibited	enclosure/unknown	none indicated
Oak Park, Il	10-40 ft excav.	no (public park)	AAQS & plan/ yes	yes
Moberly Mo	0.6 mg/kg	no	none indicated	n/a
State guidelines WI	n/a	n/a	varies/yes	yes

OEHHA review of Midway- The review conducted by OEHHA was fairly narrow in scope, focusing specifically on the second clean-up effort and, within that, on whether the testing was adequate to characterize the contamination, and whether the remediation targets were achieved, and whether they were protective of public health. The OEHHA review concluded that, for PAH contamination, the testing, targets, and remediation were, in fact, protective of public health. OEHHA did recommend additional sampling for VOCs, and additional indoor air sampling, including for VOCs. Because the review did not address the questions raised by the limited health evaluations of the residents, and because it did not consider the standard of care practiced in other (more affluent) areas, it does not afford a complete picture of the situation at Midway.

One significant step forward by OEHHA and Cal/EPA in undertaking the review of the clean-up at Midway Village was funding a technical consultant for the community, of their choosing, to participate in the review. Ms. Wilma Subra made a thorough review of the effort and offered substantive and important recommendations to Cal/EPA about the need for greater soil removal efforts, the need to sample for PCBs, the shortcomings of the indoor air sampling, and the need to relocate residents, based on accepted practice in other jurisdictions.

Is the “standard of care” adequate now to support environmental justice?

Public participation- The CEJAC Recommendations of 2003 contain a long list of criteria for effective public participation. They should form the basis for future remediations, and should be addressed to the greatest extent possible in ongoing efforts at Midway, specifically in the upcoming 5 year review, and as part of any future testing and remediation. Early involvement of the public is critical in order to establish trust. In the case of Midway, there is already an environment of distrust and animosity, which will be difficult to overcome.

From the survey of other jurisdictions, the use of an advisory committee that includes affected residents would be a very positive step and should be considered as a standard for public participation in remediation activities in the future. Also of note are the Health-based Guidelines for Air Management, Public Participation, and Risk Communication During Excavation of Former Manufactured Gas Plants, by the Department of Health and Family Services at the Wisconsin Bureau of Environmental and Occupational Health.

The long-term goal of Cal/EPA is to have agency-wide guidelines for public participation. In the near term, it may be worthwhile for DTSC to prepare interim guidelines specific to MGP sites.

Site remediation goals and conduct- There is a substantial international forum held each year (in England in 2006) on the remediation of former MGP sites, technologies, sampling techniques, health effects, and other important aspects. The proceedings of the forum are available on CD for purchase, and would be worthwhile to examine. Because there appears to be some variation across the state in the remediation of MGP sites (Midway, vs. Alhambra, vs. St. Helena), and in other states, DTSC should develop standard guidelines for site remediation (including public participation, site characterization, remediation goals,

mitigation measures and monitoring during the project, and ongoing monitoring and other institutional controls).

Post-remediation uses for site- A survey of practices in MGP site remediation suggests that the standard is moving towards deed restrictions prohibiting residential uses of remediated sites where contamination is left in place and capped. DTSC should consider prohibiting residential use in these cases. If DTSC chooses to continue to allow residential uses in such situations, the Department should enhance the institutional controls that notify the public of the contamination, prevent exposure of residents, and inform residents of the potential consequences if the controls are not adhered to (including, for example, statements such as: “Do not dig in or otherwise disturb the soil. If soil is disturbed, you may be exposed to cancer causing chemicals through your skin if you handle the soil, or by breathing in the dust.”). Notices should be posted so they are visible and remind residents and visitors, and should include a phone number for reporting cracks in hardscaping, open trenches, and other evidence of soil disturbance. There should be clear and substantial consequences for the property owner if the institutional controls are not maintained.

Relocation of residents during and after remediation- A survey of practices in MGP site remediation also suggests a trend toward tenting of excavation areas where they pose a risk of air exposure to nearby residents. In a situation where residents live on the remediation site, or where other site constraints prevail, tenting may not be able to prevent exposure of residents. In these cases, residents should be provided with temporary housing elsewhere for the duration of the project. Whether to provide permanent relocation will depend on the degree to which the site remains contaminated after remediation. Where substantial contamination is left in place, permanent relocation is a more precautionary approach, and may be the standard of care for future efforts (see above). Another consideration, however should also be the extent to which residents have already been exposed – in recognition of the fact that exposure to many of these compounds, especially carcinogens is cumulative, and may in fact be synergistic. Even when the exposure has been substantially reduced, the cumulative effect of the exposure already sustained may, with a small additional increment, become significant.

Ongoing health monitoring- Where there is reasonable cause to believe exposures have occurred in the past, some systematic way of tracking ongoing health issues would be appropriate, taking into consideration the privacy concerns of the residents. In a situation such as Midway Village, a small clinic, perhaps a mobile clinic or a more limited effort associated with the local school, could provide some basic health care and conduct monitoring in a non-intrusive way. Mobile and school-based Asthma programs have proven very successful, and can also be a source of valuable data on public health and community needs.

Recommendations

- Enhanced public participation guidelines should be developed for future MGP site clean-ups. These practices should be put into place with Midway Village residents for future efforts.
- Additional testing is needed to better characterize site contamination at Midway for pollutants other than PAHs, especially petroleum hydrocarbons, but for others mentioned as well. Guidelines should be established to ensure complete characterization of MGP sites in the future.

- A review of clean-up targets at MGP sites in other areas should be undertaken, including the post-remediation uses for the sites meeting those targets. Guidelines should be established that represent the current best standard of care, and that standard should be implemented at Midway Village.
- A review should also be conducted of the standard of care in preventing exposure during remediation activities. Enclosures, fenceline monitoring, and other precautionary measures should be included.
- A comprehensive and systematic assessment of the health effects experienced by the residents should be undertaken, unless the Department concludes the analysis by Dr. Bowler is adequate. Efforts should be made to clarify or to redo the genetic testing that indicated a 94% rate of abnormal chromosomal aberrations in the children at Midway; if provocative results such as this are not accepted and acted upon, they should at least be responded to in a more conclusive way.
- In the case of Midway Village, and in other situations where long term exposures occurred, especially to children and where the residents do not have the ability to move on their own, the Department should recommend that they be made eligible for housing that is not contaminated. The Department should also place a priority on implementing some form of health tracking, and should recommend follow-up care if disease clusters are in fact identified.
- To the extent necessary and feasible, the cost of all of these enhancements should be passed on to the responsible parties.

Conclusions

The remediation activities at Midway Village began before there was a clear national understanding of, and guidelines for identifying, characterizing and cleaning-up former MGP sites. It was also a time when awareness of environmental justice issues was not well established, and public participation was poorly conceptualized as well. In that context, DTSC's initial remediation of the site should be considered reasonable and based on sound practice, even though it was subsequently brought to a tighter standard. Accepted practice for the remediation and later use of MGP sites has undergone substantial change over the course of activities at Midway, however. For all of these reasons, there are additional actions that should be taken at the Midway Village site in order to ensure that the remediation there meets current standards of care. Further, there are systematic improvements that should be undertaken to ensure that future projects meet the environmental justice goals California has set for itself. Future actions at Midway Village, and programmatic enhancements at DTSC, should be implemented with the best possible efforts to improve public participation and public acceptance of the outcomes.